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ITALIAN GUIDE SPECIFICATIONS

Use for ITALIAN projects only

SECTION 16783

COMMUNITY ANTENNA TELEVISION (CATV) SYSTEMS
10/02

NOTE: This guide specification is issued by the
Atlantic Division, Naval Facilities Engineering
Command for regional use in Italy.

NOTE: This guide specification covers the
procurement and testing of a community antenna
television (CATV) system. It covers the usual
methods and frequently used alternatives for
providing conventional CATV systems. It does not
include unusual methods or alternatives which may be
required for special applications. The
documentation is intended to be used in conjunction
with other guide specifications required by the
design.

Comments and suggestion on this specification are
welcome and should be directed to the technical
proponent of the specification. A listing of
technical proponents, including their organization
designation and telephone number, is on the Internet.

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer
choices or locations where text must be supplied by
the designer.

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the
extent referenced. The publications are referred to in the text by the

basic designation only.

ITALIAN ELECTROTECHNICAL COMMITTEE (CEI)

NOTE: A CEI Norm is an Italian technical normative for electrical systems recognized by Italian Law, submitted by a private organization "Comitato Elettrotecnico Italiano" for the Italian territory, available in the Italian language and in some cases (but not all) in English.

CEI 12-30	(1997) Methods of measurement for equipment used in terrestrial radio-relay systems - Part 1: Measurements common to sub-systems and simulated radio-relay systems
CEI 20-22/2	(1999; V1 2001) Tests on electrical cables under fire conditions - Part 2: Fire propagation
CEI 20-37/1	(1997) Tests on gases evolved during combustion of electric cables and their compounds - Part 1: Scope and general requirements
CEI 64-8	(1998; V1 2001, V2 2001) Electrical installations of buildings

ITALIAN/EUROPEAN HARMONIZATION STANDARDS (UNI EN)(UNI ENV)(CEI EN)
(UNI EN ISO)(UNI ISO)

NOTE: A UNI EN, UNI ENV, CEI EN, UNI EN ISO or UNI ISO is a European Standard with a coincident Italian National Standard or International Standard. The two standards are identical, with most (but not all) EN's available in the English language and the UNI available only in the Italian language.

CEI EN 50083-4	(1999) Cable networks for television signals and interactive services - Part 4: Passive wideband equipment for coaxial cable networks
CEI EN 60169-24	(1998) Radio-frequency connectors - Part 24: Radio-frequency coaxial connectors with screw coupling, typically for use in 75 ohm cable distribution systems (Type F)

1.2 RELATED REQUIREMENTS

Section 16050, "Basic Electrical Materials and Methods," applies to this section with the additions and modifications specified herein.

1.3 DEFINITIONS

1.3.1 CATV

NOTE: This specification is written around a system with the headend amplifier provided by the Contractor. Coordinate with the local CATV provider as to who will provide the headend amplifier. Modify this specification accordingly if the headend amplifier is provided by the local CATV provider. As a minimum, the Designer shall provide the CATV system loss calculations with the amplifier sizes and system requirements to the EFA/EFD. Project drawings shall show the cable system, home runs, and passive and active devices in a one-line diagram.

Community antenna television (CATV) system, commonly referred to as cable television, is a network of cables, headend, electronic and passive components that process and amplify television (TV) signals for distribution from the headend equipment to the individual television outlets.

1.3.2 Headend

The connection point between CATV system equipment and equipment provided by the local CATV company. Contractor shall provide interior equipment up to and including the main amplifier located at the interior television backboard.

1.3.3 Distribution System

Distribution system transports and delivers adequate signals to each receiver. Provides distortion-free signal to TV sets by isolating each receiver from the system and by providing proper amount of signal to each set. Distribution system shall be star topology with each outlet connected to a communications closet with a feeder cable or a drop cable and each communications closet connected to the headend equipment with a trunk cable.

1.3.4 Cable

NOTE: Delete the first bracketed item for single housing units and small systems where trunk and feeder cables are not used. Edit the last sentence accordingly.

[Trunk and feeder cables are low-loss cables used to transport the desired signal from the headend equipment to the communications closet in the area to be served. These cables are used to transport signal from the [communications closet][headend equipment] into close proximity to a number of user locations in excess of 60 meters from the [communications closet][headend equipment].]Drop cables are used to transport the desired signal used from the [communications closet][headend equipment] to the wall outlet.

1.4 SYSTEM DESCRIPTION

1.4.1 Headend

Contractor shall provide interior equipment up to headend [and including the main amplifier] located at the interior CATV [backboard][cabinet].

1.4.2 Distribution System

NOTE: Choose the bracketed item depending on the CATV system design.

[Distribution system shall be star topology with each outlet connected to a communications closet with a feeder cable or a drop cable and each communications closet connected to the headend equipment with a trunk cable][Distribution system shall be star topology with each outlet connected to headend equipment with the drop cable].

1.4.3 Cable

NOTE: Delete the first bracketed item for single housing units and for small systems where trunk and feeder cables are not used. Edit the last sentence accordingly.

[Provide trunk cables to transport the desired signal from the headend equipment to the communications closet in the area to be served.][Provide [trunk] [feeder] cables to transport signal from the [headend equipment][communications closet] to user locations in excess of 60 meters from the [headend equipment][communications closet].] Provide drop cables to transport the desired signal from the [communications closet][headend equipment] to the outlet.

1.4.4 System Components

System shall provide high quality TV signals to all outlets with a return path for interactive television and cable modem access. Provide any combination of items specified herein to achieve required performance, subject to approvals, limitations, acceptance test, and other requirements specified herein. System shall include amplifiers, splitters, combiners, line taps, cables, outlets, tilt compensators; and all other parts,

components, and equipment necessary to provide a complete and usable system.

1.4.4.1 System Bandwidth

- a. Downstream: 50-750 MHz.
- b. Upstream: 5-40 MHz.

1.4.5 System Performance

1.4.5.1 Receiver Termination Signal Level

Each termination for a TV receiver must have a minimum signal level of 0 decibel millivolts (dBmV) at 55 MHz and of 0 dBmV at 750 MHz and a maximum signal of 15 dBmV or a level not to overload the receiver, for the entire system bandwidth.

1.4.5.2 Distribution System

- a. Modulation distortion at power frequencies: 4 percent or less hum distortion;
- b. Composite third order distortion for:
 - (1) CW carriers: 53 dB.
 - (2) Modulated carriers: 59 dB.
- c. Subscriber terminal isolation: 18 dB or greater.
- d. Carrier to second order beat ratio: 60 dB.
- e. Visual, aural carrier level - 24-hour variation: CEI EN 50083-4.
- f. Frequency determination: CEI EN 50083-4.
- g. Amplitude characteristic shall be within a range of plus or minus 2 decibels from 0.75 MHz to 5.0 MHz above the boundary frequency of the cable television channel, referenced to the average of the highest and lowest amplitudes within these frequency boundaries.

1.4.5.3 All New System Tolerance

The system shall not show a serious loss of carrier to noise when the system levels are lowered 3 dB below normal or a significant distortion when the levels are increased 3 dB above normal, as observed on a TV set located at the far end extremities of the system.

1.5 SUBMITTALS

NOTE:

Submittals must be limited to those necessary for

adequate quality control. The importance of an item in the project should be one of the primary factors in determining if a submittal for the item is required.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Recommended codes for Army projects are "RE" for Resident Engineer approval, "ED" for Engineering approval, and "AE" for Architect-Engineer approval. Codes following the "G" typically are not used for Navy projects.

Submittal items not designated with a "G" are considered as being for information only for Army projects and for Contractor Quality Control approval for Navy projects.

Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-02 Shop Drawings

CATV system wiring diagrams and installation details; G

CATV system components; G

SD-03 Product Data

Splitters/combiners; G

Amplifiers, including [headend,] trunk, bridging, and distribution; G

Attenuators; G

Terminators; G

Line taps; G

Outlets; G

Cables, including trunk, feeder, and drop; G

Grounding block; G

Tilt compensator; G

Connectors; G

Submittals for each manufactured item shall be the current manufacturer's descriptive literature of catalog products, equipment drawings, diagrams, performance and characteristics curves, and catalog cuts.

SD-05 Design Data

CATV System Loss Calculations; G

SD-06 Test Reports

System pretest; G

Acceptance tests; G

Operational test plan; G

Operational test procedures; G

SD-08 Manufacturer's Instructions

Connector installation; G

1.6 QUALITY ASSURANCE

1.6.1 Wiring Diagrams and Installation Details

Illustrate how each item of equipment functions in the system and include an overall system schematic indicating the relationship of CATV units on one diagram. Drawings shall include wiring diagrams and installation details of equipment indicating proposed locations, layout and arrangements, and other items that must be shown to ensure coordinated installation.

1.6.2 CATV System Loss Calculations

**NOTE: Use the second bracketed option for systems
that include amplifiers.**

Calculations shall verify that the system does not exceed the loss values specified in dBmV at the [receiver terminations] [input of all active devices and their receiver terminations]. Provide a drawing displaying all distribution network calculations. The drawing should accurately show taps, splitters, outlets, and the type and length of all trunk, feeder, and drop cables. The drawing shall show how many taps, splitters, or outlets are served by each tap or splitter.

1.6.3 Operational Test Plan

Test plan shall define tests required to ensure that the system meets technical, operational, and performance specifications. Test plan shall be based on CEI 12-30. Test plan shall include plan for testing for signal leakage. Provide test requirements and guidelines.

1.6.4 Operational Test Procedures

Use test plan and design documents to develop test procedures. Procedures shall consist of detailed instructions for a test setup, execution, and evaluation of test results.

1.6.5 Connector Installation

Provide manufacturer's instructions for installing connectors.

PART 2 PRODUCTS

NOTE: This specification is written for bidirectional devices operating from 5 to 40 MHz and from 50 to 1000 MHz. The lower end, 5 to 40 MHz provides an active return path and allows ordering of pay-per-view, cable modem and communication back to the CATV system provider. The 50 to 1000 MHz provides one-way communication to the user's service. Passive devices are rated 1000 MHz since they require more work if upgrading of the system is required in the future. Active devices such as amplifiers are easier to change out, and thus are rated for the current normal operating requirement of a minimum of 750 MHz. Coordinate with the cable service provider to ensure these specifications meet their minimum requirements for CATV service.

2.1 ELECTRONIC EQUIPMENT

Electronic components of similar type shall be produced and designed by the same manufacturer with major components of the equipment and shall have the manufacturer's name and model permanently attached. Equipment shall function properly as a complete integrated system. Equipment shall be shielded. The system shall be designed to operate within 5 to 1000 MHz bandwidth using 1000 MHz passive devices and a minimum of 750 MHz active devices.

2.2 HEADEND EQUIPMENT

NOTE: Use the headend equipment paragraphs when the headend equipment is provided by the Contractor. Delete when provided by local cable television

company.

2.2.1 Headend Amplifiers

NOTE: Broadband amplifiers are used to amplify a number of TV channels. Single-channel amplifiers are used to amplify a single TV channel.

Provide broadband distribution amplifiers. Amplifiers shall amplify broadband signals from 40 to 750 MHz and provide an amplified return path for signals from 5 to 40 MHz for 75 ohms impedance. Amplifiers shall be bidirectional with variable slope and gain control.

2.2.2 Attenuators

Provide attenuators to equalize signal levels, when required. Variable attenuators are not permitted.

2.3 DISTRIBUTION EQUIPMENT

NOTE: Delete paragraphs for distribution amplifiers when design calculations indicate they are not required.

2.3.1 Distribution Amplifiers

Distribution amplifiers shall be equipped for 75 ohms input and output impedance. Electronic equipment exposed to weather shall be equipped with weatherproof housings. Amplifiers shall be bidirectional with variable slope and gain control and shall amplify broadband signals from 50 to 750 MHz and provide an amplified return path for signals from 5 to 40 MHz for 75 ohms impedance.

2.3.1.1 Trunk Amplifiers

Trunk amplifiers shall have automatic level and slope control features.

2.3.1.2 Bridging Amplifiers

Bridging amplifiers shall be used to connect feeder cables to trunk cables.

2.3.2 Cables and Associated Hardware

NOTE: For cable subject to moisture from flooding or to atmospheric contamination such as cable near coastal areas or in cities with significant air pollution, specify the same cable protected by a black polyethylene jacket with a flooding or other

water migration deterrent compound between the jacket and the aluminum shield. When this type of cable is required, add the requirement to the item specifying the jacket and insulation in the applicable cable paragraph(s).

For systems under 90 meters, 295 feet from headend equipment to communications closet or from communication closet to communication closet, provide RG-11 coaxial trunk cable. For systems exceeding 90 meters, 295 feet from headend equipment to communication closet or from communication closet to communication closet, consideration should be given to utilizing RG-11E series cable to reduce system losses. Edit paragraphs for type of cable required in job. Delete paragraphs for trunk and feeder cable for single family housing units and for small systems where only drop cables are used.

Cabling shall comply with CEI 20-22/2 and CEI 20-37/1. Provide a labeling system for cabling. Cabling manufactured more than 12 months prior to date of installation shall not be used.

2.3.2.1 Trunk Cable

CEI 20-22/2 and CEI 20-37/1, trunk cable shall conform to CEI 64-8 requirements.

- a. Provide RG-11 coaxial cable with a CEI 20-22/2 and CEI 20-37/1 rating of CATVR and the following characteristics:
 - (1) 1.63 mm diameter for copper-clad steel center conductor.
 - (2) Foam fluorinated ethylene-propylene dielectric with nominal 10 mm outer diameter.
 - (3) Bonded foil inner-shield and 60 percent aluminum braid.
 - (4) 75 ohms impedance.
 - (5) 84 percent nominal velocity of propagation.
 - (6) Maximum attenuation of 13.5 dB/100 m at 862 MHz and 20 degrees C.
- b. Provide RG-11E with a rating of CATVR and the following characteristics:
 - (1) 1.63 mm diameter for copper-clad aluminum center conductor.
 - (2) Seamless aluminum tubing shield.
 - (3) Expanded polyethylene dielectric.

- (4) 75 ohms impedance.
- (5) Nominal diameter over outer conductor: 14 mm.
- (6) Maximum attenuation at 20 degrees C and 1000 MHz: 14.7 dB/100 meters.
- (7) Black medium density polyethylene jacket or PVC jacket.
- (8) Nominal 87 percent velocity of propagation.

2.3.2.2 Feeder Cable

NOTE: CATVP is plenum rated fire proof type cable.
Provide type CATVP plenum rated cabling in ducts,
plenums and other air-handling spaces. Choose the
first bracketed option for CATV cable and the second
bracketed option for CATVP cable throughout. Delete
feeder cable paragraphs for single family housing
units and for small systems where only drop cables
are used.

CEI 20-22/2 and CEI 20-37/1, provide RG-11 coaxial trunk cable with a rating of [CATV][CATVP] and the following characteristics:

- a. 1.63 sq. mm copper-clad steel center conductor.
- b. Foam fluorinated ethylene-propylene dielectric with 10 mm nominal outer diameter.
- c. Bonded foil inner-shield and 60 percent aluminum braid.
- d. 75 ohms impedance.
- e. 82 to 84 percent nominal velocity of propagation.
- f. Maximum attenuation of 13.5 dB/100 m of loss at 862 MHz and 20 degrees C.
- g. [Black PVC] [PVC low smoke polymer or FEP] jacket as applicable.

2.3.2.3 Drop Cable

NOTE: CATVP is plenum rated fire proof type cable.
Provide type CATVP plenum rated cabling in ducts,
plenums and other air-handling spaces. Choose the
first bracketed option for CATV cable and the second
bracketed option for CATVP cable throughout.

CEI 20-22/2 and CEI 20-37/1. Provide RG 6 coaxial cable with a rating of [CATV][CATVP] and the following characteristics:

- a. 1.02 sq. mm copper-clad steel center conductor.
- b. Bonded foil inner-shield and 90 percent aluminum braid.
- c. Characteristic impedance of 75 ohms.
- d. Gas injected foam polyethylene dielectric.
- e. Nominal capacitance, conductor to shield, of 54 pf per meter.
- f. Maximum attenuation:

MHz	DB/100 m	MHz	DB/100 m
5	1.38	400	12.8
55	4.66	450	13.5
211	9.15	550	15.0
270	10.4	750	17.5
300	11.0	870	19.0
330	11.7	1000	20.4

- g. [Black polyvinyl chloride] [PVC low smoke polymer or FEP] jacket, minimum diameter of 7 mm.
- h. 100 percent sweep testing from 5 MHz to a minimum of 1000 MHz.

2.3.3 Terminators

CEI EN 50083-4 and CEI EN 60169-24. Terminators shall be rated for 75 ohms.

2.3.4 Splitters/Combiners

NOTE: Slope is the straight line of the average response between 54 MHz and 450 MHz. Return loss is a measure of impedance matching.

CEI EN 50083-4. Use splitters/combiners with characteristics equal to or exceeding the characteristics listed in this paragraph over the entire operating band. All unused outlets must be terminated with 75 ohm terminators.

- a. Return loss: 18 dB.
- b. Bandwidth: 5 to 1000 Mhz.
- c. Peak to Valley: Not to exceed 1 dB across bandwidth of device.

2.3.5 Line Taps

CEI EN 50083-4. Line taps shall have 18 dB minimum isolation from each tap to the thru-line. Pressure tap offs are not permitted. Taps shall be rated

from 5 to 1000 MHz and shall have a peak to valley not to exceed one dB to one GHz.

2.3.6 Outlets

NOTE: Designer has the option to provide a combination convenience receptacle and CATV outlet in one outlet box. Provide detail on drawings indicating combined outlet with isolation barrier between power and communication sections.

CEI EN 50083-4. Provide flush mounted, 75 ohm, F-type connector outlets rated from 5 to 1000 MHz, in standard electrical outlet boxes [with isolation barrier].

2.3.7 Connectors

NOTE: Delete trunk and feeder cable connectors for housing units and when trunk cable and feeder cable are not used in job.

CEI EN 50083-4 and CEI EN 60169-24. Provide one piece connectors. Trunk and feeder cable connectors shall be pin type. Drop cable connectors shall be feed through type.

2.3.8 Tilt Compensator

CEI EN 50083-4. Provide tilt compensators as required. Provide with linear tilt of 12 dB from bandwidth of 50 MHz to 1000 MHz.

2.4 GROUNDING AND BONDING

Provide ground rods and connections in accordance with Section 16402, "Interior Distribution System".

2.4.1 Grounding Block

Provide corrosion-resistant grounding block suitable for [indoor] [outdoor] installation.

PART 3 EXECUTION

3.1 DISTRIBUTION SYSTEM

NOTE: Indicate cable routing and equipment locations on the drawing.

Distribution system shall conform to requirements specified herein.

Installation shall be in accordance with CEI EN 50083-4.

3.1.1 Raceway

NOTE: Use the bracketed option when conduit stub-out
is provided for the local cable television company.

Provide cable installed in raceways such as conduit and cable trays.
Raceway shall comply with Section 16402, "Interior Distribution System."
[Provide 78 mm, minimum, PVC from interior headend location to exterior
CATV company connection location. Coordinate location and requirements
with the local cable television company.]

3.1.2 Grounding

NOTE: Show location of grounding blocks on
drawings. Grounding blocks may be used either
inside or outside. Since they are intended to
protect equipment from foreign currents, they are
most frequently placed inside, close to the cable
entrance

Provide the grounding block at the main cable television backboard. Ground
this device according to the requirements of CEI 64-8.

3.1.3 Trunk, Feeder, and Drop Cables

NOTE: Delete trunk and feeder from the title for
housing units and when trunk and feeder cable are
not used in the job.

Provide interior cable in conduit in compliance with CEI 64-8, CEI 20-22/2,
and CEI 20-37/1 and in accordance with Section 16402, "Interior
Distribution System." Provide cable to grounding blocks, to line taps and
to outlets.

3.2 FIELD QUALITY CONTROL

3.2.1 System Pretest

NOTE: Use the first bracketed item requiring the
Contractor to align and balance the system, where
amplifiers are provided. For single family housing
units, delete second bracketed item requiring
testing at 151 and 547 MHz. Testing at these
frequencies is required for other applications.

Use option for testing at each outlet instead of random sampling and at furthest outlet when a small number of outlets are provided in the job.

Upon completing installation of the CATV system, the Contractor [shall align and balance the system and] shall perform complete pretesting. During the system pretest, Contractor, utilizing the approved spectrum analyzer or signal level meter, shall verify that the system is fully operational and meets all the system performance requirements of the specification. Contractor shall test the signal loss in dBmV at 55, [151, 547,] and 750 MHz. The signal levels shall be 0 dBmV (1000 microvolts), minimum. Any deficiencies found shall be corrected and revalidated by follow up testing.

The signal shall not exceed 15 dBmV over the entire system bandwidth. Contractor shall measure and record the video and audio carrier levels of the frequency levels specified at each of the following points in the system:

- a. Furthest outlet from [each communication closet] [service entrance point of connection].
- b. A random sampling of 25 percent of the [outlets [from each communication closet]] [housing units].
- c. At each outlet.
- [d. [Headend and]Distribution amplifier inputs and outputs.]

3.2.2 Acceptance Tests

NOTE: Use option for testing at each outlet instead of random sampling and at furthest outlet when a small number of outlets are provided in the job.

Contractor shall notify the Contracting Officer of system readiness 10 days prior to the date of acceptance testing. Contractor shall also coordinate with the local CATV provider and allow them to attend witness tests. CATV system shall be tested in accordance with the approved test plan in the presence of the Contracting Officer's representative to certify acceptable performance. System test shall verify that the total system meets all the requirements of the specification and complies with the specified standards. Contractor shall verify that no signal leakage exists in conformance with manufacturer's instructions. System leakage shall also be tested at the headend location with signal applied to system. Deficiencies revealed by the testing shall be corrected [on the [housing units][outlets] sampled as well as on the [units][outlets] not sampled]and revalidated by follow-up testing. Contractor shall conduct testing at each of the following points in the system:

- a. Furthest outlet from [each communication closet][service entrance point of connection].

b. A random sampling of 25 percent of the [outlets[from each communication closet]][housing units] as designated by the Contracting Officer.

[c. At each outlet.]

[d. [Headend and]Distribution amplifier inputs and outputs.]

-- End of Section --